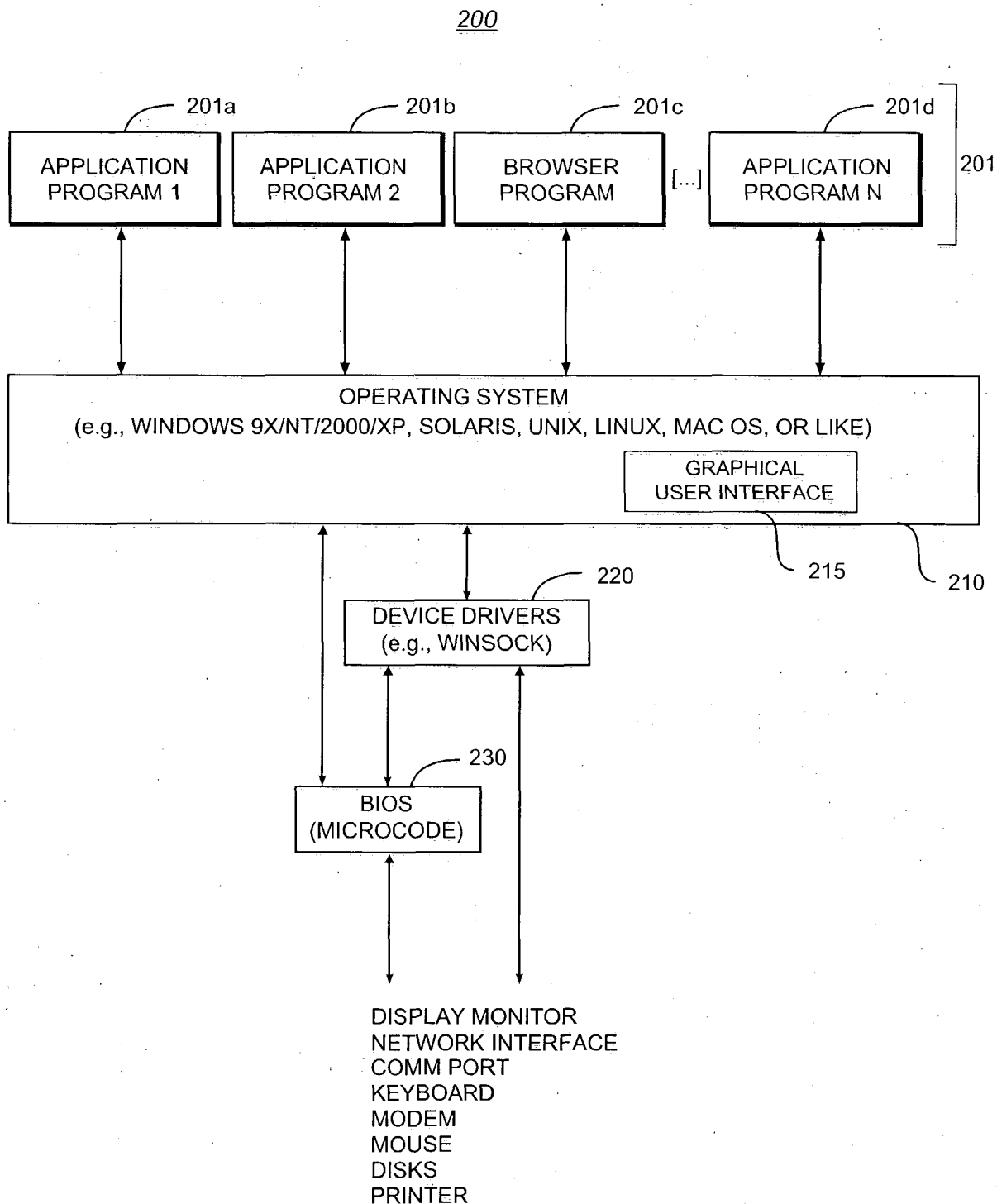


FIG. 1
(PRIOR ART)

**FIG. 2**

300

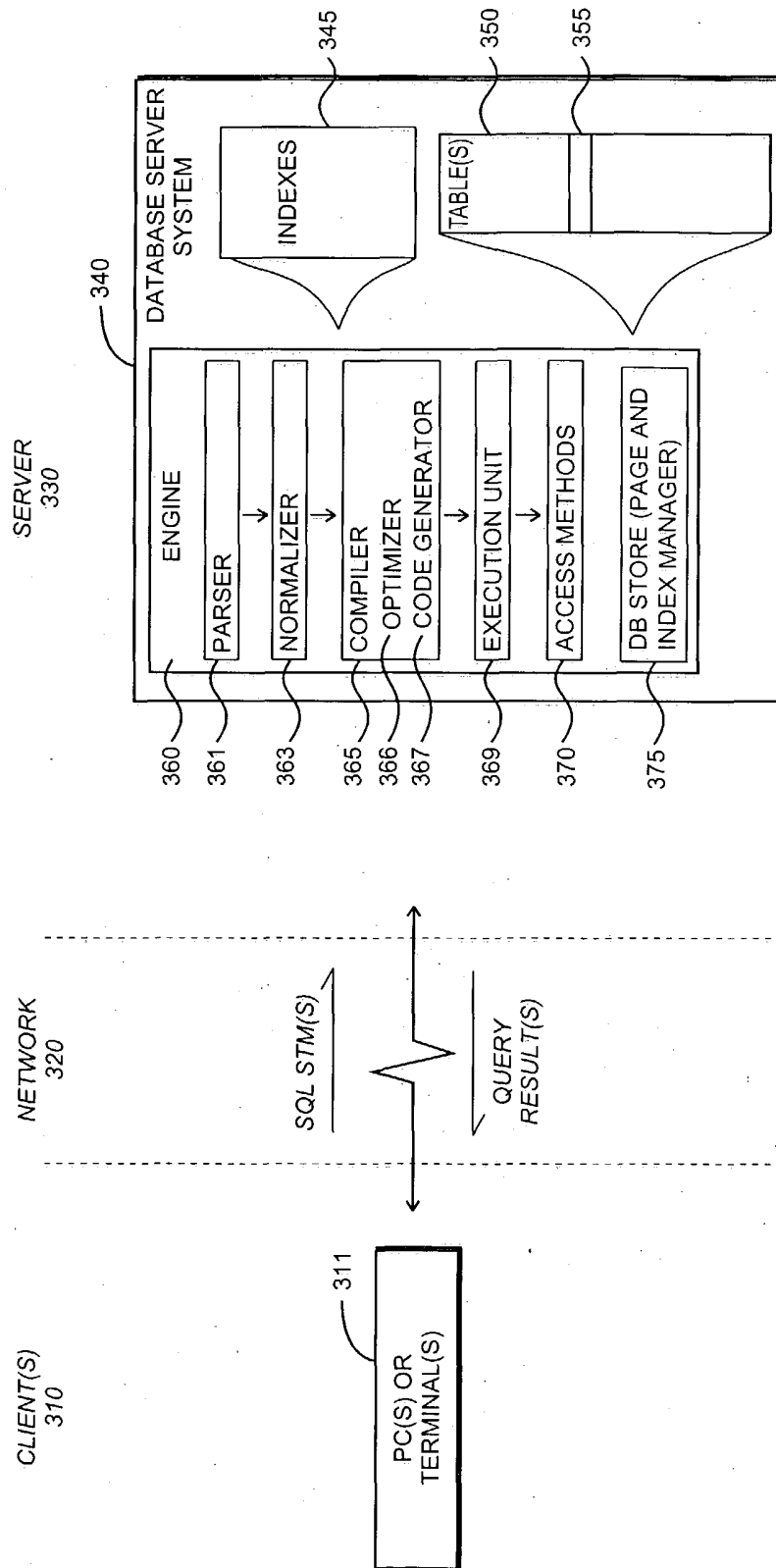


FIG. 3

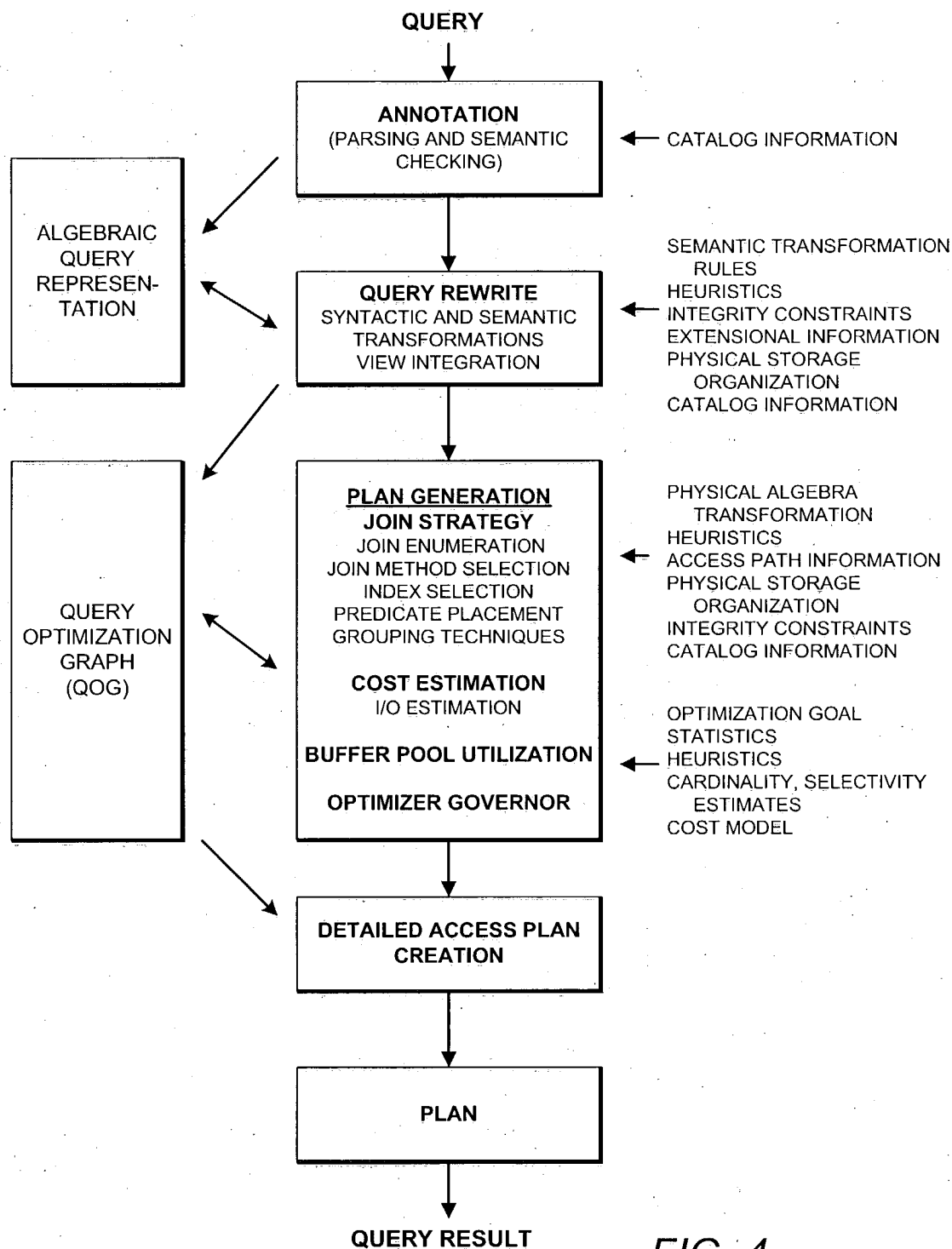
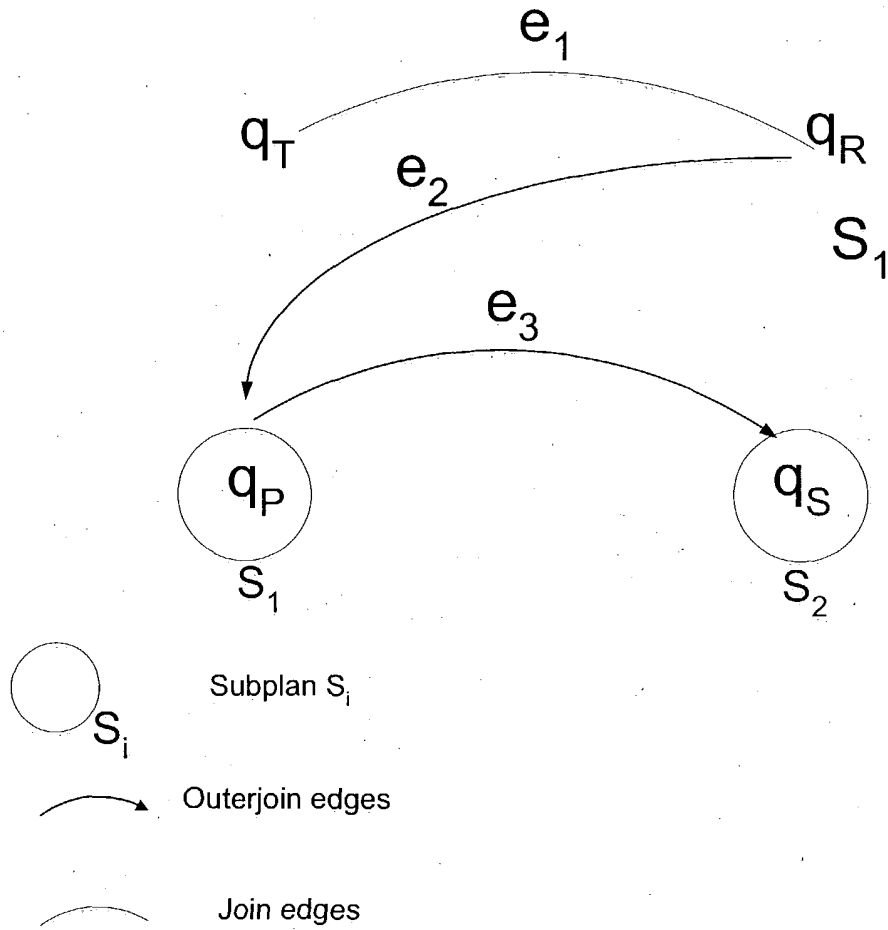
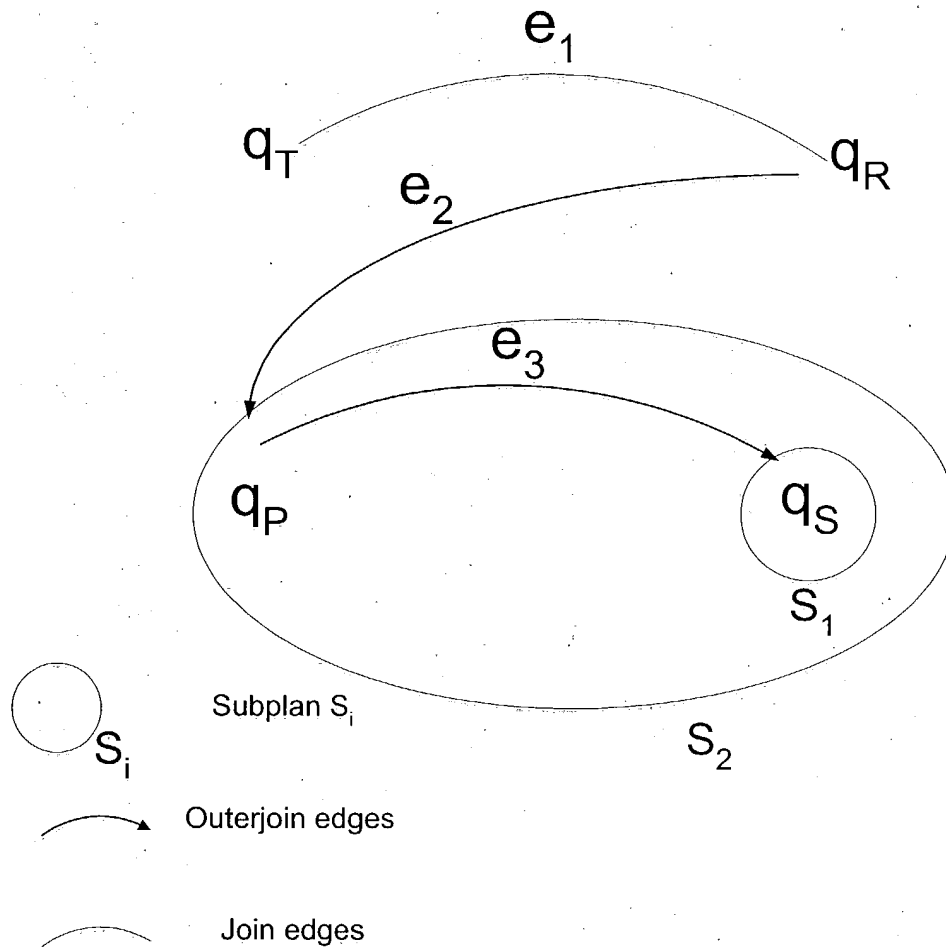


FIG. 4



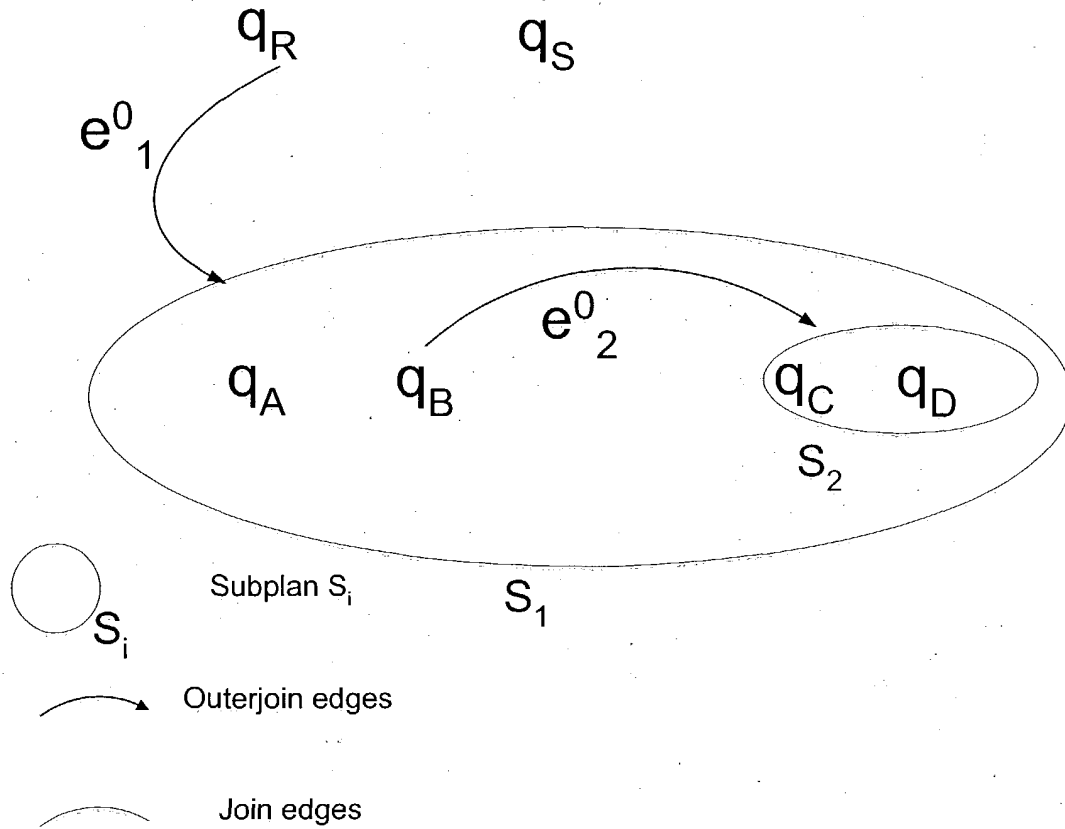
QOG representation for table expression $(T \stackrel{PT,R}{\bowtie} R \stackrel{PR,P}{\rightarrow} P) \stackrel{PP,S}{\rightarrow} S$. $S_2 = (\{q_P\}, p_{R,P}, \emptyset)$, $S_1 = (\{q_S\}, p_{P,S}, \emptyset)$.
 $S_0 = (\{q_T, q_R, S_1, S_2\}, p_{T,R}, \{e_1, e_2, e_3\})$. $V = \{q_T, q_R, q_P, q_S, S_0, S_1, S_2\}$.
 $e_1 = (\{q_T, q_R\}, p_{T,R})$, $e_2 = (\{q_R\}, S_2)$, $e_3 = (\{S_2\}, S_1)$.
 $E = \{e_1, e_2, e_3\}$.

FIG. 5A



QOG representation for table expression $T \overset{PT,R}{\bowtie} R \overset{PR,P}{\rightarrow} (P \overset{PP,S}{\rightarrow} S)$. $S_1 = (\{q_S\}, p_{P,S}, \emptyset)$, $S_2 = (\{q_P, S_1\}, p_{R,P}, \{e_3\})$, $e_3 = (q_P, S_1)$. $S_0 = (\{q_T, q_R, S_2\}, p_{T,R}, \{e_1, e_2\})$. $V = \{q_T, q_R, q_P, q_S, S_0, S_1, S_2\}$. $e_1 = (\{q_T, q_R\}, p_{T,R})$, $e_2 = (\{q_R\}, S_2)$. $E = \{e_1, e_2, e_3\}$.

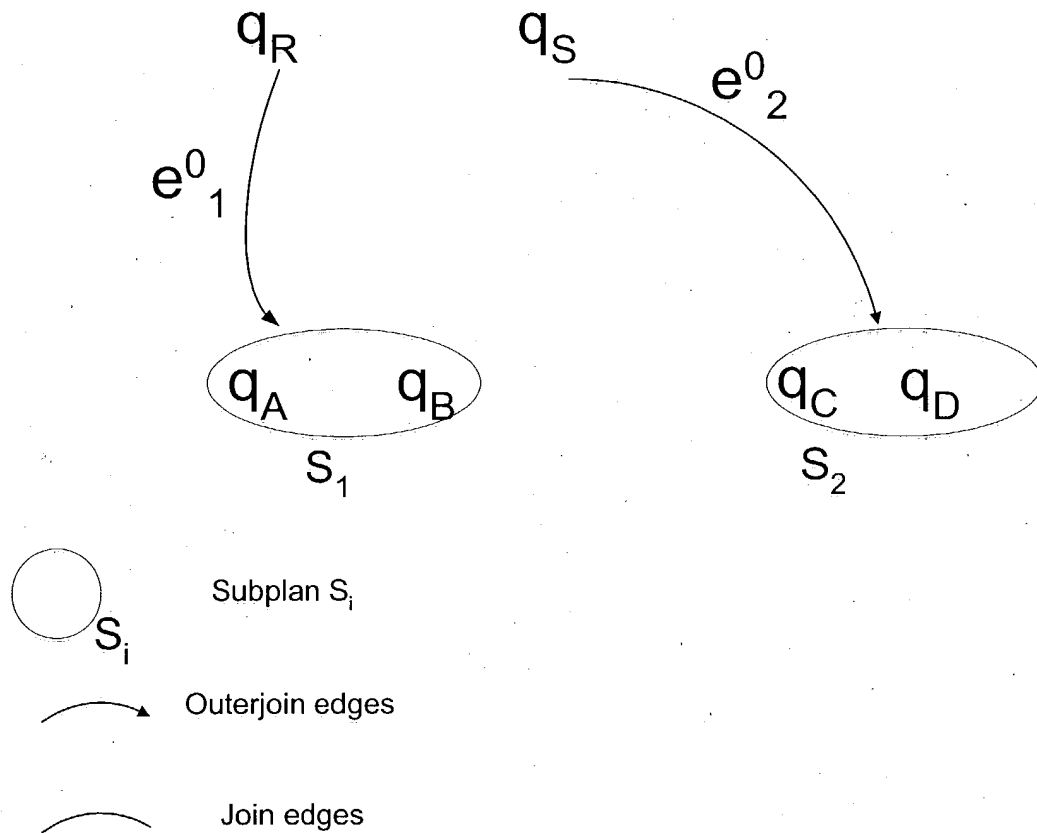
FIG. 5B



QOG representation for table expression $(R \bowtie S) \xrightarrow{p_{R,A}}_{oj1} [(A \bowtie B) \xrightarrow{p_{B,D}}_{oj2} (C \bowtie D)]$

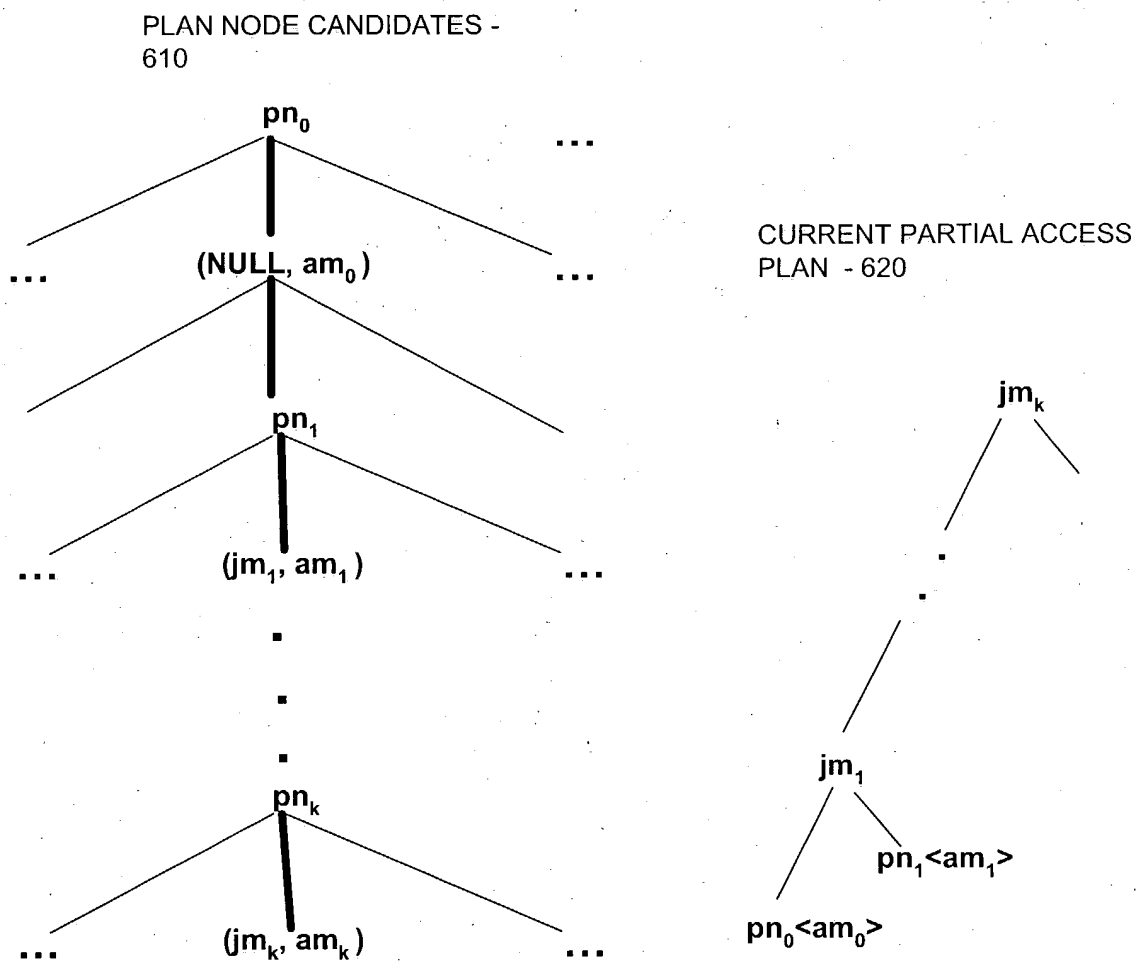
$S_2 = (\{q_C, q_D\}, p_{B,D}, \emptyset)$, $S_1 = (\{q_A, q_B, S_2\}, p_{R,A}, \{e_2^o\})$, $e_2^o = (\{q_B\}, S_2)$, $e_1^o = (\{q_R\}, S_1)$, $S_0 = (\{q_R, q_S, S_1\}, \emptyset, \{e_1^o\})$, $V = \{q_C, q_D, q_A, q_B, q_R, q_S, S_0, S_1, S_2\}$, $E = \{e_1^o, e_2^o\}$.

FIG. 5C



QOG representation for table expression $[(R \bowtie S) \xrightarrow{p_{R,A}}_{oj1} (A \bowtie B)] \xrightarrow{p_{S,D}}_{oj2} (C \bowtie D)$ $e_1^o = (\{q_R\}, S_1)$, $e_2^o = (\{q_S\}, S_2)$, $S_1 = (\{q_A, q_B\}, p_{R,A}, \emptyset)$, $S_2 = (\{q_C, q_D\}, p_{S,D}, \emptyset)$, $S_0 = (\{q_R, q_S, S_1, S_2\}, \emptyset, \{e_1^o, e_2^o\})$, $V = \{q_C, q_D, q_A, q_B, q_R, q_S, S_0, S_1, S_2\}$, $E = \{e_1^o, e_2^o\}$.

FIG. 5D



GRAPHICAL REPRESENTATION OF SEARCH SPACE FOR A SUBPLAN
WHICH IS TRAVERSED USING A DEPTH-FIRST SEARCH PROCEDURE

FIG. 6

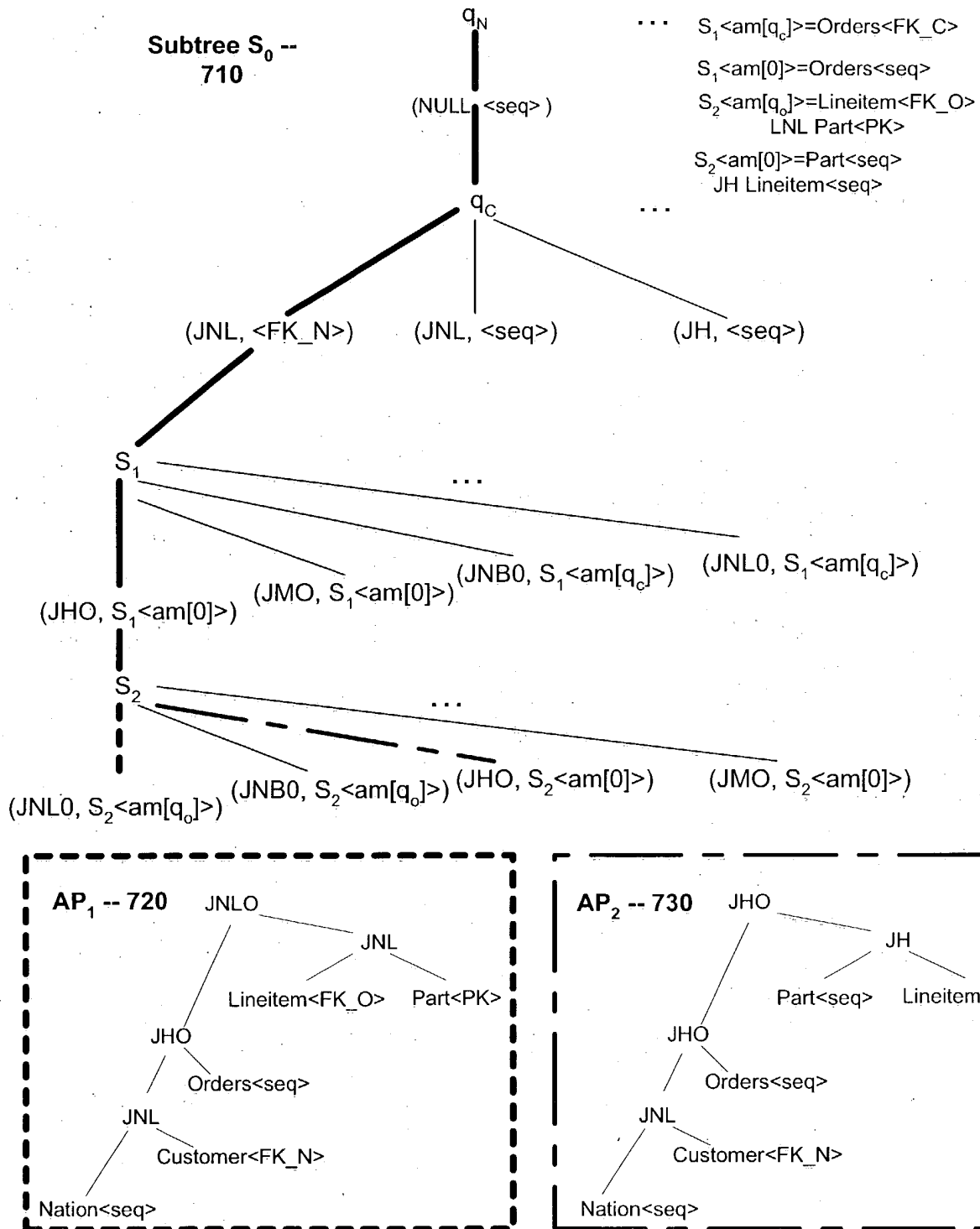


FIG. 7

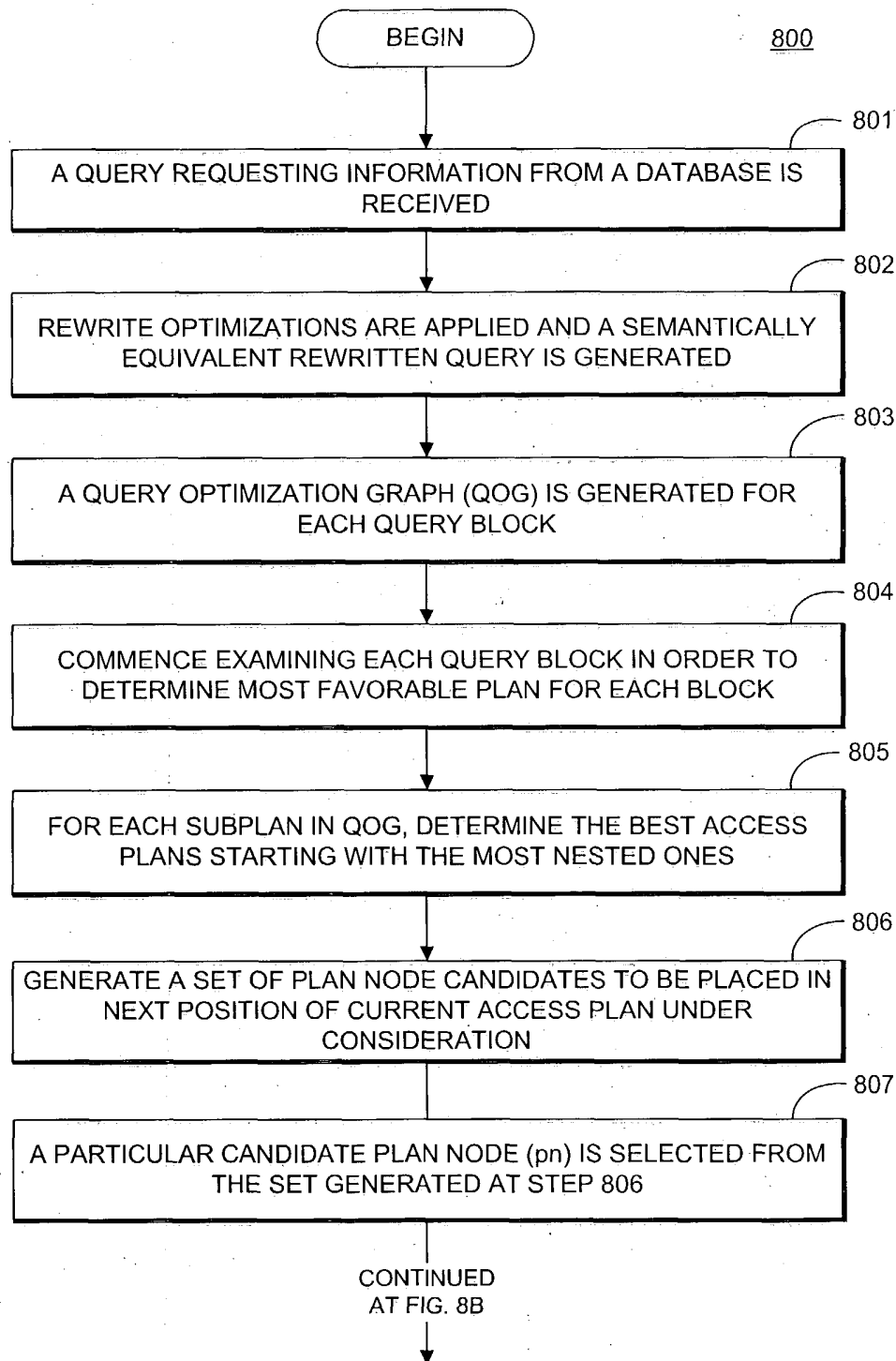
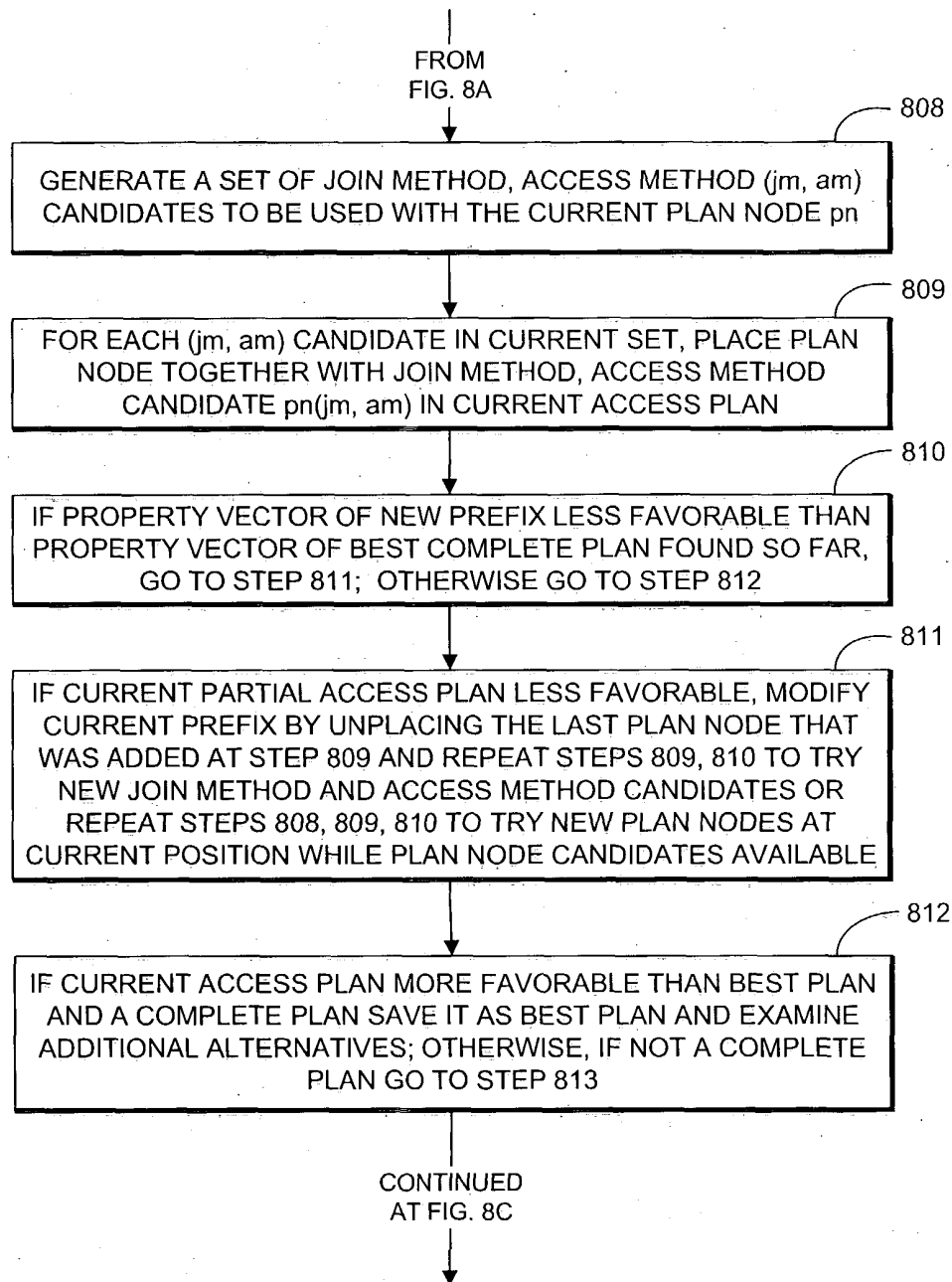
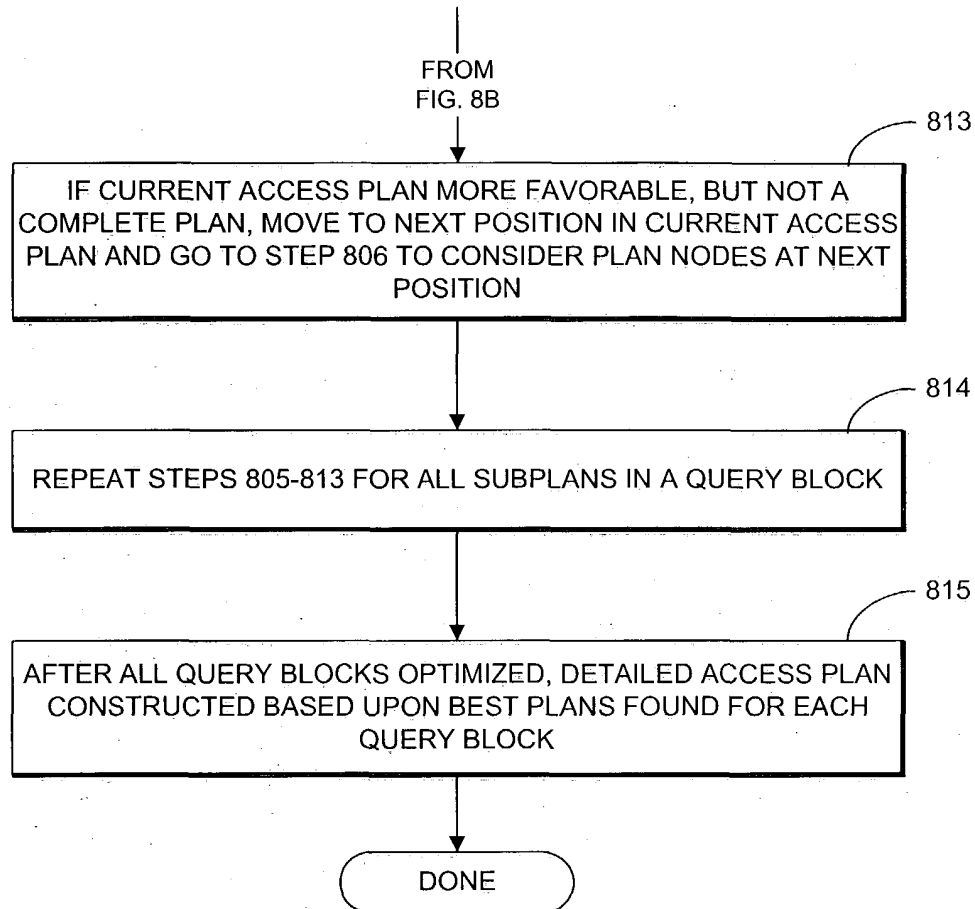


FIG. 8A

**FIG. 8B**

*FIG. 8C*